



05930729A

# United States Patent [19]

**Khamis et al.**

[11] **Patent Number:** 5,930,729  
 [45] **Date of Patent:** Jul. 27, 1999

[54] **RANGE EXTENSION ACCESSORY  
 APPARATUS FOR CELLULAR MOBILE  
 TELEPHONES**

[75] **Inventors:** Elias G. Khamis, Newport Beach;  
 Massimo Massa, Placentia, both of  
 Calif.

[73] **Assignee:** Pacific Cellstar, Inc., Irvine, Calif.

[21] **Appl. No.:** 08/657,809

[22] **Filed:** May 31, 1996

## Related U.S. Application Data

[63] Continuation-in-part of application No. 08/340,242, Nov. 16, 1994, Pat. No. 5,649,009, which is a continuation-in-part of application No. 08/062,577, May 17, 1993, Pat. No. 5,422,934.

[51] **Int. Cl.<sup>6</sup>** ..... H04M 11/00

[52] **U.S. Cl.** ..... 455/571; 455/11.1; 455/20

[58] **Field of Search** ..... 455/11.1, 20, 571,  
 455/572, 575, 556, 557, 127

## [56] References Cited

### U.S. PATENT DOCUMENTS

4,850,006	7/1989	Sasaki et al.	455/571
5,044,010	8/1991	Frenkiel et al.	455/411
5,276,918	1/1994	Cornforth et al.	455/127

5,422,934 6/1995 Massa ..... 455/571

*Primary Examiner*—Edward F. Urban

*Attorney, Agent, or Firm*—William L. Chapin

## [57] ABSTRACT

An accessory apparatus for mobile radio telephones, particularly those used in cellular networks, permits utilization of the full communication range capability of a vehicle-mounted cellular radio telephone by a cordless portable handset remote from the vehicle. The apparatus includes a plug-in adapter unit located in a vehicle and interconnected between the existing handset and transceiver of the vehicle-mounted radio telephone. The adapter unit includes a first, resident, down-link transceiver operating at radio frequencies outside of the cellular frequency band, and adapted to receive demodulated audio and/or data signals from the resident cellular transceiver, and retransmit the signals via a low-power modulated down-link RF carrier signal to a portable remote cordless handset/transceiver. The cordless handset has a keypad, speaker, microphone and transceiver which receives down-link transmissions from the adapter unit transceiver, and transmits voice or data signals via a low-power up-link carrier signal to the adapter unit transceiver, which demodulates the information signals from the up-link carrier signal, and conveys them to the existing radio telephone transceiver for transmission at high power to the cellular network.

6 Claims, 27 Drawing Sheets

